

AB Nullstellen

①

$$2x^2 - 5x - 12 = 0$$

$$2(x^2 - 2,5x - 6) = 0 \quad | :2$$

$$x^2 - 2,5x = 6$$

$$x^2 - 2,5x + 1,25^2 = 6 + 1,25^2$$

$$(x - 1,25)^2 = 7 \frac{9}{16} \quad | \sqrt{}$$

$$x_{1/2} - 1,25 = \pm \sqrt{\frac{121}{16}}$$

$$x_{1/2} = 1,25 \pm \frac{11}{4}$$

$$x_1 = 4; x_2 = -\frac{3}{2}$$

z.B.

Faktor 2 vor dem quadr.
Term eliminieren
Termglieder mit x separieren

quadr. ergänzen

B.F. anwenden

Wurzel ziehen

nach x auflösen

② a) $x^2 + 5x + 6 = 0$

$$x_{1/2} = \frac{-5 \pm \sqrt{25 - 4 \cdot 1 \cdot 6}}{2 \cdot 1} = \frac{-5 \pm 1}{2}$$

$$x_1 = -3; x_2 = -2$$

b) $x^2 + x - 20 = 0$

$$x_{1/2} = \frac{-1 \pm \sqrt{1 - 4 \cdot 1 \cdot (-20)}}{2 \cdot 1} = \frac{-1 \pm 9}{2}$$

$$x_1 = -5; x_2 = 4$$

c) $x^2 - x - 12 = 0$

$$x_{1/2} = \frac{+1 \pm \sqrt{1 - 4 \cdot 1 \cdot (-12)}}{2 \cdot 1} = \frac{1 \pm 7}{2}$$

$$x_1 = -3; x_2 = 4$$

d) $2x^2 + 7x + 3 = 0$

$$x_{1/2} = \frac{-7 \pm \sqrt{49 - 4 \cdot 2 \cdot 3}}{2 \cdot 2} = \frac{-7 \pm 5}{4}$$

$$x_1 = -3; x_2 = -0,5$$

e) $10x^2 + 11x + 3 = 0$

$$x_{1/2} = \frac{-11 \pm \sqrt{121 - 4 \cdot 10 \cdot 3}}{2 \cdot 10} = \frac{-11 \pm 1}{20}$$

$$x_1 = -0,6; x_2 = -0,5$$

f) $3x^2 + 8x - 3 = 0$

$$x_{1/2} = \frac{-8 \pm \sqrt{64 - 4 \cdot 3 \cdot (-3)}}{3 \cdot 2} = \frac{-8 \pm 10}{6}$$

$$x_1 = -3; x_2 = \frac{1}{3}$$

g) $5x^2 - 8x - 21 = 0$

$$x_{1/2} = \frac{8 \pm \sqrt{64 - 4 \cdot 5 \cdot (-21)}}{5 \cdot 2} = \frac{8 \pm 22}{10}$$

$$x_1 = -1,4; x_2 = 3$$

h) $-15x^2 - 19x + 56 = 0$

$$x_{1/2} = \frac{19 \pm \sqrt{361 - 4 \cdot (-15) \cdot 56}}{2 \cdot (-15)} = \frac{19 \pm 61}{-30}$$

$$x_1 = 1,4; x_2 = -\frac{8}{3}$$

i) $20x^2 - 7x - 6 = 0$

$$x_{1/2} = \frac{7 \pm \sqrt{49 - 4 \cdot 20 \cdot (-6)}}{2 \cdot 20} = \frac{7 \pm 23}{40}$$

$$x_1 = -0,4; x_2 = 0,75$$

k) $3y^2 - 13y = 2y$

$$3y^2 - 15y = 0$$

$$y_{1/2} = \frac{15 \pm \sqrt{225 - 0}}{6} = \frac{15 \pm 15}{6}$$

$$y_1 = 0; y_2 = 5$$

$$l) 0,2x^2 + 1,6 = 1,14x$$

$$0,2x^2 - 1,14x + 1,6 = 0$$

$$x_{1/2} = \frac{1,14 \pm \sqrt{1,14^2 - 4 \cdot 0,2 \cdot 1,6}}{2 \cdot 0,2}$$

$$= \frac{1,14 \pm \sqrt{-0,14}}{0,4}$$

keine Lösungen

$$m) 0,5x^2 + 0,15x = 0,27$$

$$0,5x^2 + 0,15x - 0,27 = 0$$

$$x_{1/2} = \frac{-0,15 \pm \sqrt{0,0225 + 0,5 \cdot 4 \cdot 0,27}}{2 \cdot 0,5}$$

$$= \frac{-0,15 \pm 0,75}{1}$$

$$x_1 = -0,9; x_2 = 0,6$$

$$n) 4z^2 + 6 = 9$$

einfacher:
 $4z^2 - 3 = 0$

$$4z^2 - 3 = 0$$

$4z^2 = 3$
 $z^2 = 3/4 \Rightarrow z = \pm \frac{\sqrt{3}}{2}$

$$z_{1/2} = \frac{0 \pm \sqrt{0 - 4 \cdot 4 \cdot (-3)}}{2 \cdot 4}$$

$$= \pm \frac{4\sqrt{3}}{8}$$

$$z_1 = \frac{1}{2}\sqrt{3}; z_2 = -\frac{1}{2}\sqrt{3}$$

$$o) 0,7x^2 + 0,9x = 1$$

$$0,7x^2 + 0,9x - 1 = 0$$

$$x_{1/2} = \frac{-0,9 \pm \sqrt{0,81 - 4 \cdot 0,7 \cdot (-1)}}{2 \cdot 0,7}$$

$$= \frac{-0,9 \pm 1,9}{1,4}$$

$$x_1 = -2; x_2 = \frac{5}{7}$$

$$③ a) \frac{1}{4}x^2 + \frac{1}{2}x - 2 = 0 \quad | \cdot 4$$

$$x^2 + 2x - 8 = 0$$

$$x_{1/2} = \frac{-2 \pm \sqrt{4 - 4 \cdot 1 \cdot (-8)}}{2}$$

$$= \frac{-2 \pm 6}{2}$$

$$x_1 = -4; x_2 = 2$$

$$p) 3v^2 + 4,2 = 8,8v$$

$$3v^2 - 8,8v + 4,2 = 0$$

$$v_{1/2} = \frac{8,8 \pm \sqrt{8,8^2 - 4 \cdot 3 \cdot 4,2}}{2 \cdot 3}$$

$$= \frac{8,8 \pm 5,2}{6}$$

$$v_1 = 0,6; v_2 = \frac{7}{3}$$

$$q) 4x^2 = 8x + 1$$

$$4x^2 - 8x - 1 = 0$$

$$x_{1/2} = \frac{8 \pm \sqrt{64 - 4 \cdot 4 \cdot (-1)}}{2 \cdot 4}$$

$$= \frac{8 \pm \sqrt{70}}{8}$$

$$x_{1/2} = 1 \pm \frac{1}{8}\sqrt{70}$$

$$r) 24x + 19 = 18x^2$$

$$18x^2 - 24x - 19 = 0$$

$$x_{1/2} = \frac{24 \pm \sqrt{576 - 4 \cdot 18 \cdot (-19)}}{2 \cdot 18}$$

$$= \frac{24 \pm 18\sqrt{6}}{36}$$

$$x_{1/2} = \frac{2}{3} \pm \frac{1}{2}\sqrt{6}$$

$$s) 0,5u^2 + 4,5u = 1,5u$$

einfacher:
 $0,5u \cdot (u - 6) = 0$
 $u_1 = 0; u_2 = 6$

$$0,5u^2 - 3u = 0$$

$$u_{1/2} = \frac{3 \pm \sqrt{9 - 4 \cdot 0,5 \cdot 0}}{2 \cdot 0,5}$$

$$= \frac{3 \pm 3}{1}$$

$$u_1 = 0; u_2 = 6$$

$$b) \frac{1}{2}y^2 - \frac{1}{3}y - \frac{1}{6} = 0 \quad | \cdot 6$$

$$3y^2 - 2y - 1 = 0$$

$$y_{1/2} = \frac{2 \pm \sqrt{4 - 4 \cdot 3 \cdot (-1)}}{2 \cdot 3}$$

$$= \frac{2 \pm 4}{6}$$

$$y_1 = -\frac{1}{3}; y_2 = 1$$

$$c) 0,2z^2 - 0,6z + 0,4 = 0 \quad | \cdot 5$$

$$z^2 - 3z + 2 = 0$$

$$z_{1/2} = \frac{3 \pm \sqrt{9 - 4 \cdot 1 \cdot 2}}{2}$$

$$= \frac{3 \pm 1}{2}$$

$$\underline{z_1 = 1; z_2 = 2}$$

$$e) z^2 + \frac{7}{4}x - \frac{15}{8} = 0 \quad | \cdot 8$$

$$8z^2 + 14x - 15 = 0$$

$$z_{1/2} = \frac{-14 \pm \sqrt{196 - 4 \cdot 8 \cdot (-15)}}{2 \cdot 8}$$

$$= \frac{-14 \pm 26}{16}$$

$$\underline{z_1 = -2,5; z_2 = 0,75}$$

$$g) 2v^2 = \frac{1}{3}v + \frac{2}{3}$$

$$2v^2 - \frac{1}{3}v - \frac{2}{3} = 0 \quad | \cdot 3$$

$$6v^2 - v - 2 = 0$$

$$v_{1/2} = \frac{1 \pm \sqrt{1 - 4 \cdot 6 \cdot (-2)}}{2 \cdot 6}$$

$$= \frac{1 \pm 7}{12}$$

$$\underline{v_1 = -0,5; v_2 = \frac{2}{3}}$$

$$i) \frac{8}{7}y^2 = \frac{7}{5}y + \frac{1}{7}y^2$$

$$y^2 - \frac{7}{5}y = 0 \quad | \cdot 5$$

$$5y^2 - 7y = 0$$

$$5y(y - \frac{7}{5}) = 0$$

$$\underline{y_1 = 0; y_2 = \frac{7}{5} = 1,4}$$

$$\textcircled{4} \text{ I) } y = -x^2 + 2x + 3$$

$$y = -[(x - 2x + 1^2) - 1^2 - 3]$$

$$= -(x - 1)^2 + 4$$

$$S(1|4)$$

$$x_{1/2} = \frac{-2 \pm \sqrt{4 - 4 \cdot (-1) \cdot 3}}{2 \cdot (-1)}$$

$$= \frac{-2 \pm 4}{-2}$$

$$\underline{x_1 = 3; x_2 = -1} \quad \checkmark$$

$$\underline{D = 16 > 0 \Rightarrow 2 \text{ Nullstellen}}$$

$$d) x^2 - \frac{5}{6}x + \frac{1}{6} = 0 \quad | \cdot 6$$

$$6x^2 - 5x + 1 = 0$$

$$x_{1/2} = \frac{5 \pm \sqrt{25 - 4 \cdot 6 \cdot 1}}{2 \cdot 6}$$

$$= \frac{5 \pm 1}{12}$$

$$\underline{x_1 = \frac{1}{3}; x_2 = \frac{1}{2}}$$

$$f) u^2 - \frac{3}{20}u - \frac{1}{100} = 0 \quad | \cdot 100$$

$$100u^2 - 15u - 1 = 0$$

$$u_{1/2} = \frac{15 \pm \sqrt{225 - 4 \cdot 100 \cdot (-1)}}{2 \cdot 100}$$

$$= \frac{15 \pm 25}{200}$$

$$\underline{u_1 = -0,05; u_2 = 0,2}$$

$$h) \frac{1}{80} = \frac{1}{3}t^2 + \frac{7}{120}t$$

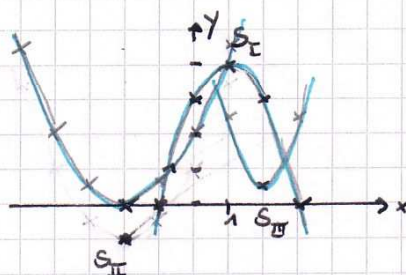
$$\frac{1}{3}t^2 + \frac{7}{120}t - \frac{1}{80} = 0 \quad | \cdot 240$$

$$80t^2 + 14t - 3 = 0$$

$$t_{1/2} = \frac{-14 \pm \sqrt{196 - 4 \cdot 80 \cdot (-3)}}{2 \cdot 80}$$

$$= \frac{-14 \pm 34}{160}$$

$$\underline{t_1 = -0,3; t_2 = 0,125}$$



Anzahl der Nullstellen:
 $y_s = 4 > 0, a = -1 < 0$
 $\Rightarrow 2 \text{ Nullstellen}$

$$\text{II) } y = \frac{1}{2}x^2 + 2x + 2$$

$$y = \frac{1}{2}[(x^2 + 4x + 2^2) - 2^2 + 4]$$

$$= \frac{1}{2}(x+2)^2$$

→ Scheitert auf x-Achse

$$S_{\text{I}}(-2|0) \Rightarrow 1 \text{ NS}$$

$$x_{1/2} = \frac{-2 \pm \sqrt{4 - 4 \cdot \frac{1}{2} \cdot 2}}{2 \cdot \frac{1}{2}}$$

$$= \frac{-2}{1}$$

$$= -2$$

$$D = 0! \Rightarrow 1 \text{ NS}$$

$$x_{1/2} = \frac{8 \pm \sqrt{64 - 4 \cdot 2 \cdot 9}}{2 \cdot 2}$$

$$\text{III) } y = 2x^2 - 8x + 9$$

$$y = 2[(x^2 - 4x + 2^2) + 2^2 + 4,5]$$

$$= 2(x-2)^2 + 0,5$$

$y_s > 0, a > 0$
 \Rightarrow keine NS

$$S_{\text{III}}(2|0,5)$$

$$D < 0 \Rightarrow \text{keine NS}$$

$$\textcircled{5} \text{ a) } D = 144 - 4 \cdot 1 \cdot 38 < 0$$

\Rightarrow keine NS

$$\text{b) } D = 144 - 4 \cdot 4 \cdot 9 = 0$$

$\Rightarrow 1 \text{ NS}$

$$\text{c) } D = 25 - 4 \cdot 2 \cdot 3 > 0$$

$\Rightarrow 2 \text{ NS}$

$$\text{d) } D = 256 - 4 \cdot 5 \cdot 13 < 0$$

\Rightarrow keine NS

$$\text{e) } D = 4 - 4 \cdot 7 \cdot (-11) > 0$$

$\Rightarrow 2 \text{ NS}$

$$\text{f) } D = 3600 - 4 \cdot 12 \cdot 75 = 0$$

$\Rightarrow 1 \text{ NS}$

$$\textcircled{6} \text{ a) } x_{1/2} = \frac{4 \pm \sqrt{16 - 4 \cdot 3 \cdot 4}}{6}$$

LF

keine Lösung

$$\text{b) } x + 8 = \pm 11$$

LF

$$x_1 = -19; x_2 = 3$$

$$\text{c) } 30x^2 - 6x = 0$$

Faktorisieren

$$30x(x - 0,2) = 0$$

$$x_1 = 0; x_2 = 0,2$$

$$\text{d) } x^2 + 14x = -49$$

$$x^2 + 14x + 49 = 0$$

$$(x+7)^2 = 0$$

$$x_1 = -7$$

BF

$$\text{e) } 11x^2 - 22 = 0$$

$$11x^2 = 22 \quad | :11$$

$$x^2 = 2$$

$$x_{1/2} = \pm \sqrt{2}$$

LF

$$\text{f) } x^2 + 30x = 0$$

$$x(x + 30) = 0$$

Fakt.

$$x_1 = 0; x_2 = -30$$

$$\text{g) } (x+3)^2 = 5$$

LF

$$x+3 = \pm \sqrt{5}$$

$$x_1 = -3 + \sqrt{5}; x_2 = -3 - \sqrt{5}$$

$$\text{h) } 144x^2 = 81$$

$$x^2 = \frac{81}{144}$$

LF

$$x_{1/2} = \pm \frac{9}{12} = \pm \frac{3}{4}$$

$$\text{i) } 3(x+5)(x-2) = 0$$

ablesen

$$x_1 = -5; x_2 = 2$$

$$\text{k) } (x+\sqrt{2})^2 = 2$$

$$x+\sqrt{2} = \pm \sqrt{2}$$

$$x_1 = 0; x_2 = -2\sqrt{2}$$

LF

$$\text{l) } (x+1)(x-2) = 4$$

$$x^2 - x - 2 = 4$$

LF

$$x^2 - x - 6 = 0$$

$$x_{1/2} = \frac{1 \pm \sqrt{1 - 4 \cdot 1 \cdot (-6)}}{2} = \frac{1 \pm 5}{2}$$

$$x_1 = -2; x_2 = 3$$

$$\text{m) } \frac{3}{2}x^2 - 2x - \frac{7}{4} = \frac{7}{4} \quad | \cdot 2$$

$$3x^2 - 4x - 7 = 0$$

LF

$$x_{1/2} = \frac{4 \pm \sqrt{16 - 4 \cdot 3 \cdot (-7)}}{2 \cdot 3}$$

$$x_1 = -1; x_2 = 3$$

$$10) a) 2x(x+3) - x(x-1) + 6 = 0$$

$$2x^2 + 6x - x^2 + x + 6 = 0$$

$$x^2 + 7x + 6 = 0$$

$$x_{1/2} = \frac{-7 \pm \sqrt{49 - 4 \cdot 1 \cdot 6}}{2 \cdot 1}$$

$$= \frac{-7 \pm 5}{2}$$

$$\underline{x_1 = -6; x_2 = -1}$$

$$c) (x-5)(2x-17) - (x-7)(3x+1) = 84$$

$$2x^2 - 27x + 85 - 3x^2 + 20x + 7 = 84$$

$$-x^2 - 7x + 8 = 0$$

$$x_{1/2} = \frac{7 \pm \sqrt{49 - 4 \cdot (-1) \cdot 8}}{-2}$$

$$= \frac{7 \pm 9}{-2}$$

$$\underline{x_1 = 1; x_2 = -8}$$

$$e) (0,5x-2)^2 - (0,5x+2)(0,5x-2) = 0$$

$$0,25x^2 - 2x + 4 - 0,25x^2 + 4 = 0$$

$$-2x + 8 = 0$$

$$\underline{x = 4}$$

$$11) a) n \cdot (n+1) = 182$$

$$n^2 + n - 182 = 0$$

$$n_{1/2} = \frac{-1 \pm \sqrt{1 - 4 \cdot 1 \cdot (-182)}}{2}$$

$$= \frac{-1 \pm 27}{2}$$

$$\underline{n_1 = 13} \quad (n_2 = -14)$$

$$13; 14$$

$$c) n \cdot (n+1) = n + (n+1) + 55$$

$$n^2 + n = 2n + 56$$

$$n^2 - n - 56 = 0$$

$$(n+7)(n-8) = 0$$

$$\underline{n_1 = 8} \quad (n_2 = -7)$$

$$b) (4-x)^2 + (2x-1)^2 = 10$$

$$16 - 8x + x^2 + 4x^2 - 4x + 1 = 10$$

$$5x^2 - 12x + 7 = 0$$

$$x_{1/2} = \frac{12 \pm \sqrt{144 - 140}}{10}$$

$$= \frac{12 \pm 2}{10}$$

$$\underline{x_1 = 1; x_2 = 1,4}$$

$$d) (2x-3)(3x-2) - (3x-1)^2 = 10$$

$$6x^2 - 13x + 6 - 9x^2 + 6x - 1 = 10$$

$$-3x^2 - 7x - 5 = 0$$

$$x_{1/2} = \frac{7 \pm \sqrt{49 - 4 \cdot (-3) \cdot (-5)}}{-2 \cdot 3}$$

$$= \frac{7 \pm \sqrt{-11}}{-6} \quad \text{f}$$

\Rightarrow keine Lösung

$$f) (1,5x-4,5)^2 + (7,5+2,5x)^2 = 0$$

$$2,25x^2 - 13,5x + 20,25 + 56,25 + 37,5x + 6,25x^2 = 0$$

$$8,5x^2 + 24x + 76,5 = 0$$

$$D = 24^2 - 4 \cdot 8,5 \cdot 76,5 < 0$$

\Rightarrow keine Lösung

$$b) n^2 + (n+1)^2 + (n+2)^2 = 530$$

$$n^2 + n^2 + 2n + 1 + n^2 + 4n + 4 = 530$$

$$3n^2 + 6n + 5 - 530 = 0 \quad | :3$$

$$n^2 + 2n - 185 = 0$$

$$n_{1/2} = \frac{-2 \pm \sqrt{4 + 4 \cdot 1 \cdot 185}}{2 \cdot 1}$$

$$= \frac{-2 \pm 28}{2}$$

$$\underline{n_1 = 13} \quad (n_2 = -15)$$

Aufgaben zu quadratischen Gleichungen

1) a) $2x^2 + 16 = 12x$ (LF)

$$2x^2 - 12x + 16 = 0$$

$$x^2 - 6x + 8 = 0$$

$$\Delta = 36 - 4 \cdot 8 = 4$$

$$x_{1/2} = \frac{6 \pm 2}{2} \quad \# \quad \underline{x_1 = 4; x_2 = 2}$$

c) $-x^2 - 2 = 0,25 + 9x$ (LF)

$$x^2 + 9x + 2,25 = 0$$

$$\begin{aligned} \Delta &= 81 - 4 \cdot 1 \cdot 2,25 \\ &= 81 - 9 \\ &= 72 \end{aligned}$$

$$x_{1/2} = \frac{-9 \pm \sqrt{72}}{2} = \frac{-9 \pm 6\sqrt{2}}{2}$$

$$\underline{x_{1/2} = -4,5 \pm 3\sqrt{2}}$$

e) $t^2 + \sqrt{2}t - 1 = 0$

$$\Delta = 2 - 4 \cdot 1 \cdot (-1) = 6 \quad (LF)$$

$$\underline{t_{1/2} = \frac{-\sqrt{2} \pm \sqrt{6}}{2}}$$

b) $2 = (3+x)^2$ (F)

$$\pm\sqrt{2} = 3+x$$

$$\underline{x_1 = -3 + \sqrt{2}}$$

$$\underline{x_2 = -3 - \sqrt{2}}$$

d) $3x + 16 = 0$

$$\underline{x = -\frac{16}{3}}$$

f) $x^2 - x = x - x^2$ *Scheit!*

$$2x^2 - 2x = 0 \quad \text{oder}$$

$$2x(x-1) = 0 \quad \text{Fakt!}$$

$$\underline{x_1 = 0; x_2 = 1}$$

2) a) $y = a(x+2)^2$ (a beliebig)

b) $y = x^2 + 2$

c) $y = (x+2)(x-2) = x^2 - 2$

d) $y = (x+1)(x+3)$

3) a) ablesen: $x_1 = 3; x_2 = -2$

b) $x_{1/2} = \frac{2 \pm \sqrt{4 - 4 \cdot 1 \cdot (-3)}}{2} = \frac{2 \pm 4}{2}$

$$\underline{x_1 = -1; x_2 = 3}$$

d) $0,5x^2 - 2x + 2 = 0 \quad | \cdot 2$

$$x^2 - 4x + 4 = 0 \quad (BF)$$

$$(x-2)^2 = 0$$

$$\underline{x = 2}$$

4) a) $y = (x+3) \cdot (x-2) \quad (LF)$

$$\underline{= x^2 + x - 6}$$

z.B.: Schreibe die Funktionsgleichung in der Nullstellenform mit $a=1$ und multipliziere den Term aus.

b) Variabel

⑩ a) $2x(x+3) - x(x-1) + 6 = 0$

$$2x^2 + 6x - x^2 + x + 6 = 0$$

$$x^2 + 7x + 6 = 0$$

$$x_{1/2} = \frac{-7 \pm \sqrt{49 - 4 \cdot 1 \cdot 6}}{2 \cdot 1}$$

$$= \frac{-7 \pm 5}{2}$$

$$\underline{x_1 = -6; x_2 = -1}$$

c) $(x-5)(2x-17) - (x-7)(3x+1) = 84$

$$2x^2 - 27x + 85 - 3x^2 + 20x + 7 = 84$$

$$-x^2 - 7x + 8 = 0$$

$$x_{1/2} = \frac{7 \pm \sqrt{49 - 4 \cdot (-1) \cdot 8}}{-2}$$

$$= \frac{7 \pm 9}{-2}$$

$$\underline{x_1 = 1; x_2 = -8}$$

e) $(0,5x-2)^2 - (0,5x+2)(0,5x-2) = 0$

$$0,25x^2 - 2x + 4 - 0,25x^2 + 4 = 0$$

$$-2x + 8 = 0$$

$$\underline{x = 4}$$

⑪ a) $n \cdot (n+1) = 182$

$$n^2 + n - 182 = 0$$

$$n_{1/2} = \frac{-1 \pm \sqrt{1 - 4 \cdot 1 \cdot (-182)}}{2}$$

$$= \frac{-1 \pm 27}{2}$$

$$\underline{n_1 = 13} \quad (n_2 = -14)$$

$$13; 14$$

c) $n \cdot (n+1) = n + (n+1) + 55$

$$n^2 + n = 2n + 56$$

$$n^2 - n - 56 = 0$$

$$(n+7)(n-8) = 0$$

$$\underline{n_1 = 8} \quad (n_2 = -7)$$

b) $(4-x)^2 + (2x-1)^2 = 10$

$$16 - 8x + x^2 + 4x^2 - 4x + 1 = 10$$

$$5x^2 - 12x + 7 = 0$$

$$x_{1/2} = \frac{12 \pm \sqrt{144 - 4 \cdot 5 \cdot 7}}{10}$$

$$= \frac{12 \pm 2}{10}$$

$$\underline{x_1 = 1; x_2 = 1,4}$$

d) $(2x-3)(3x-2) - (3x-1)^2 = 10$

$$6x^2 - 13x + 6 - 9x^2 + 6x - 1 = 10$$

$$-3x^2 - 7x - 5 = 0$$

$$x_{1/2} = \frac{7 \pm \sqrt{49 - 4 \cdot (-3) \cdot (-5)}}{-2 \cdot 3}$$

$$= \frac{7 \pm \sqrt{-11}}{-6} \quad \text{f}$$

\Rightarrow keine Lösung

f) $(1,5x-4,5)^2 + (7,5+2,5x)^2 = 0$

$$2,25x^2 - 13,5x + 20,25 + 56,25 + 37,5x + 6,25x^2 = 0$$

$$8,5x^2 + 24x + 76,5 = 0$$

$$D = 24^2 - 4 \cdot 8,5 \cdot 76,5 < 0$$

\Rightarrow keine Lösung

b) $n^2 + (n+1)^2 + (n+2)^2 = 590$

$$n^2 + n^2 + 2n + 1 + n^2 + 4n + 4 = 590$$

$$3n^2 + 6n + 5 = 590 \quad |:3$$

$$n^2 + 2n - 195 = 0$$

$$n_{1/2} = \frac{-2 \pm \sqrt{4 + 4 \cdot 1 \cdot 195}}{2 \cdot 1}$$

$$= \frac{-2 \pm 28}{2}$$

$$\underline{n_1 = 13} \quad (n_2 = -15)$$

Aufgaben zu quadratischen Gleichungen

1) a) $2x^2 + 16 = 12x$ (LF)

$$2x^2 - 12x + 16 = 0$$

$$x^2 - 6x + 8 = 0$$

$$D = 36 - 4 \cdot 8 = 4$$

$$x_{1,2} = \frac{6 \pm 2}{2} \quad \underline{x_1 = 4; x_2 = 2}$$

c) $-x^2 - 2 = 0,25 + 9x$ (LF)

$$x^2 + 9x + 2,25 = 0$$

$$D = 81 - 4 \cdot 1 \cdot 2,25 \\ = 81 - 9 \\ = 72$$

$$x_{1,2} = \frac{-9 \pm \sqrt{72}}{2} = \frac{-9 \pm 6\sqrt{2}}{2}$$

$$\underline{x_{1,2} = -4,5 \pm 3\sqrt{2}}$$

e) $t^2 + \sqrt{2}t - 1 = 0$

$$D = 2 - 4 \cdot 1 \cdot (-1) = 6$$
 (LF)

$$\underline{t_{1,2} = \frac{-\sqrt{2} \pm \sqrt{6}}{2}}$$

b) $2 = (3+x)^2$ (F)

$$\pm\sqrt{2} = 3+x$$

$$\underline{x_1 = -3 + \sqrt{2}}$$

$$\underline{x_2 = -3 - \sqrt{2}}$$

d) $3x + 16 = 0$

$$\underline{x = -\frac{16}{3}}$$

f) $x^2 - x = x - x^2$ *Sehen!*

$$2x^2 - 2x = 0$$
 oder

$$2x(x-1) = 0$$
 Fakt

$$\underline{x_1 = 0; x_2 = 1}$$

2) a) $y = a(x+2)^2$ (a beliebig)

b) $y = x^2 + 2$

c) $y = (x+2)(x-2) = x^2 - 2$

d) $y = (x+1)(x+3)$

3) a) ablesen: $x_1 = 3; x_2 = -2$

b) $x_{1,2} = \frac{2 \pm \sqrt{4 - 4 \cdot 1 \cdot (-3)}}{2} = \frac{2 \pm 4}{2}$

$$\underline{x_1 = -1; x_2 = 3}$$

c) ablesen: $x = 2$

d) $0,5x^2 - 2x + 2 = 0$ | $\cdot 2$

$$x^2 - 4x + 4 = 0$$
 (F)

$$(x-2)^2 = 0$$

$$\underline{x = 2}$$

4) $y = (x+3) \cdot (x-2)$ (LF)

$$\underline{= x^2 + x - 6}$$

z.B.: Schreibe die Funktionsgleichung in der Nullstellenform mit $a=1$ und multipliziere den Term aus.

b) Variabel

